ENLARGED TONSILS AND ADENOIDS:

SOME OBSERVATIONS ON THEIR ETIOLOGY

and

A SUGGESTED LINE OF TREATMENT.

THESIS

Submitted for the M.D. Edinburgh 1922

by

Bernard Venn Dunn, M.B.Ch.B. 1913.

Loughborough.

C O N T E N T S.

V11. PATHOLOGY.

1. The essential nature of the Lesions.
2. The Faucial Tonsil.
3. The Pharyngeal Tonsil.
4. The Lingual Tonsil.

V111. BACTERIOLOGY.

1. Under healthy conditions.
2. After removal for Hypertrophy.
3. Relationship of the Tubercle Bacillus.

1X. ETIOLOGY.

1. Age.
2. Sex.
3. Heredity.
4. Contagion.
5. Climate.
6. Race.
7. Infectious and Catarrhal Diseases.
8. Artificial Feeding.
9. Dental Caries.
10. Shape of the nose.
11. Dietetic faults.
12. Bad hygienic surroundings.
13. Effect of Cleft Palate.
14. Inter-relationship of Adenoids and enlarged Tonsils.
15. Summary and correlation.
    Table A.
    Table B.

X. PATHOGENESIS.

X1. TREATMENT.

1. Introduction.
2. Prophylaxis.
3. Treatment:
   (a) Slight cases (Group 1.)
   (b) Cases of moderate severity (Group 11.)
   (c) Severe cases (Group 111.)
   (d) Cases in which operation is contra-indicated (Group 1V.)

Group 1.

Group 11.

Group 11.

i. Change of air.
ii. Medicinal measures.
iii. Local treatment.
iv. Dental work.
v. Nasal drill.

Group 111.

i. Tonsillectomy or tonsillotomy?
ii. Methods of Enucleation:
    A) The Guillotine method.
    B) Enucleation by dissection.
iii. Preparation of the patient for operation.
iv. Environment at time of operation.
v. The combined operation for removal of the Tonsils (by the Whillis-Pybus method or modification) and the Adenoids.
    A) Position of the Patient.
    B) Choice of anaesthetic.
    C) Instruments.
    D) Technique
    E) Haemorrhage.
        (1) Causes
        (2) Frequency
        (3) Treatment
vi. Tonsillotomy.
vii. The operation for removal of the tonsils by dissection - the method of Waugh and its modifications. Local anaesthesia.
viii. After treatment.
ix. End results after operative treatment.

Group IV.

i. The contra-indications to operation.
ii. Methods of treatment.
    A) X-rays.
    B) Lymph gland extract.
    C) Mineral caustics.
    D) Galvano cautery.

X11. SUMMARY AND CONCLUSIONS.

BIBLIOGRAPHY.

Modern Methods in the Treatment of

Enlarged Tonsils and Adenoids.

---

1. Introduction.

1. Gravity of the Condition.

Chronic enlargement of the faucial and pharyngeal tonsils is perhaps the most common disease of children and when its physical and mental effects are taken into consideration it is certainly amongst the most grave.

2. Its widespread nature.

The widespread nature of the disease is shown in the estimate, probably a low one, made in the 1920 Report of the Chief Medical Officer to the Board of Education. He states that the number of children in England and Wales who suffer from the disease to such an extent as to call for surgical intervention may be placed at 5 - 7% of all school children.

3. Effects.

(a) Catarrhal.

Those who adopt a laissez faire attitude to the disorder lose sight of the bad effects of chronic catarrh which is the local result of it and which may, by direct extension, cause Eustachian obstruction, middle ear disease, laryngitis, bronchitis, gastric disturbance, conjunctivitis, etc.

(b) Mechanical.

But far more disastrous are the mechanical effects which result from the obstruction of the nasal passages. The typical facies, the loss of nasal resonance and the mispronunciation of words add to the appearance of mental obtuseness which already exists on account of the anoxaemia. The mal-development of the upper jaw resulting in the highly concave palate and the V-shaped alveolar arch causes the teeth to be thrown out of line and to project beyond those of the lower jaw. Premature decay follows. The nasal cavities become narrowed from disease, the turbinals approach the septum, which itself may become deflected. Deformities of the chest - pigeon-breast and Harrison's sulcus - result from the conjunction of the obstructed airway and the softened bones. Whether or no the essential cause of rickets, on the one hand, and hypertrophied tonsils, on the other, be similar as Merral (Lancet, 1921, ii, p. 994) suggests, there is no doubt of the frequent association of their symptoms.

(c) Toxic and Reflex.

The disturbance of the child's sleep, due to mouth breathing, may cause anaemia and general irritability, while the defective respiration combined with the toxic absorption may have such far-reaching effects as convulsions, nocturnal enuresis, laryngo-spasm, night terrors, asthma and stammering. Dyspnoea is a common concomitant.

(d) Infective.

A further train of effects is connected with

bacterial infection. Recurrent attacks of tonsillitis and peritonsillar abscess are of frequent occurrence and can be entirely prevented by extirpation of the tonsils. Tuberculosis of the cervical glands frequently owes its origin to infection through the tonsil (Walsham, Trans. Path. Soc., London, 1898, XLIV. p. 67) while other observers have found that 5% - 6% of adenoid growths show histological evidence of tuberculosis (St. Clair Thomson Diseases of the Nose and Throat 2nd edit.). Poynton and Paine (Lancet, 1900, ii, p. 861) maintain that the diplococcus rheumaticus has been conclusively demonstrated as making its way into the system through the diseased tonsils.

4. Object of Treatment.

The object of treatment must be the complete and perfect cure of the disease or, short of this, the relief of any symptoms, obstructive or otherwise, to which the enlarged organs give rise.

5. Frequency of Recurrence after Treatment.

The frequency with which cases are brought under observation for the recurrence of the hypertrophy or of tonsillitis after having been subjected to treatment show that the methods which had previously been adopted must have been fallacious or the operative measures imperfect. Waugh (Lancet 1909, i, p. 1314) in an account of 900 cases says that 143 of these had had tonsillotomy performed by other surgeons with no relief. All surgeons seem agreed that tonsillar "remains" are very much more difficult of

removal than the whole tonsil at the original operation.

6. Modern Methods of Treatment.

The methods of treatment which are in vogue to-day may be divided into:-

(a) Operative.

(b) Non-operative.

(a) Operative.

i. The Tonsils. A. Tonsillotomy - the partial removal of the tonsils.

B. Tonsillectomy.

(1) The Whillis-Pybus-Sluder method in which the tonsil is completely removed with the guillotine.

(2) The method of Waugh, Ballenger and others in which the tonsil is completely removed by dissection.

(3) The combined methods of dissection and either guillotine or snare.

(4) Removal with the cold wire snare or the galvano-caustic snare.

(5) Morcellement - advocated by Laurens and other French Surgeons.

ii. The Adenoids. A. With Lowenburg's forceps, or its modifications.

B. With the Gottstein curette, or its modifications.

The use of the finger nail has now been abandoned.

(b) Non-Operative.

(i) By attention to the general health and medicinal treatment. This alone is usually insufficient.

(ii) By nasal drill (Hickling and Lapage, Ormiston and others) and respiratory exercises.

(iii) By X-ray treatment (Stewart and others).

(iv) By the administration of lymph gland extract (Ashley).

(v) By means of local applications of a chemical nature, e.g. London Paste.

(vi) By electrical measures:

(A) Electrolysis
(B) The Electrocautery.

There is an undoubted tendency towards a backward swing of the pendulum in relation to the necessity for surgical intervention in cases of the disease. This can be accounted for largely by the unsatisfactory results which have attended many of the operations performed.

7. Scope of Thesis.

The etiology of the condition has given rise in the past to a considerable amount of controversy and is still a subject of doubt and the scope of this thesis is to describe some original work on the subject and to attempt to bring the different theories into line; to give an account of the present views as to treatment; to decide, by reference to the work of others and the author's own clinical experience, if andwhen surgical interference is called for; to denote what operative measures have resulted in the past in the complete and permanent cure of the disease; and to set down a definite course to be followed in the treatment of these affections.

11. Historical Outline.

The History of Medicine is inundated with references to Chronic Enlargement of the Faucial Tonsils. The first description of enucleation is ascribed to Celgus (A.D. 10). He employed the primitive method of loosening the enlarged tonsils with the finger and then tearing them out; or, if this were impracticable, he advised seizing them with a hook and excising them with a scalpel. Morel Mackenzie in his admirable epitome (Diseases of the Throat and Nose) quotes AEtius (A.D. 490) who preferred tonsillotomy, fearing haemorrhage in extirpation of the entire tonsils; and Paulus Aegineta (A.D. 750) who "cut them out by the roots." He tells us of Ambroise Paré (1509) who counselled trachectomy when serious enlargement existed; Fabricius (1540) advocated extreme care as "this surgical procedure is neither easy nor altogether safe"; Severini (1637) used caustics when the tonsils were sessile and a hook and knife when pedunculated; Dionis (1672) opposed removal altogether owing to the physiological importance of the tonsils; Wiseman (1734) ligatured the tonsil and cut off the projecting portion; Caqué (1757) excised the tonsils and showed that the dread of haemorrhage was exaggerated; Louis (1774) cut off the superfluous portion with a blunt pointed bistoury or a pair of scissors.

In the nineteenth century the operation became, and has since remained, one of the recognised procedures of surgery, but still the controversy remains whether the affected glands should be totally or partially removed, or whether, on the

other hand, they should not be left severely alone.

In 1827 Physic invented his guillotine and to the end of the nineteenth century the guillotine method held the field. In 1854 Chassaignac published his celebrated monograph "Leçons sur L'Hypertrophie des Amygdales" in which he presented a lucid description of the condition. In 1898 Ballenger pointed out the infrequency of complete removal and, ipso facto, the unsatisfactory results of the operation. He advocated a return to dissection and improved the technique of this operation. In 1908 Waugh still further improved the method of enucleation by blunt dissection. In 1911 Whillis and Pybus in this country and Sluder in America restored the guillotine to popularity by shewing that enucleation could be perfectly well performed by its use. In 1913 Elphick and Howarth in this country and La Force in America described a technique with a two bladed guillotine, the outer blade being blunt for the purpose of crushing the pedicle of the tonsil and the inner one being sharp for the purpose of detaching the tonsil.

The clinical results of the enlarged pharyngeal tonsil were known to Hippocrates who described the adenoid facies, though he failed to associate it with adenoids. The discovery of the pharyngeal tonsil is variously ascribed to Schneider in 1655 (Ingals) and to Santorini in 1724 (St. Clair Thomson). In 1860 Czermak reported what were probably the first adenoid growths ever seen. In 1865 Voltolini removed adenoids with the electrocautery and thereby much improved his patient's deafness. In this country Sir Andrew Clarke was the first to call attention to the condition in 1862 under the title

of "Naso-palatine Gland Disease" (Lennox Brown: "The Throat and Nose and their Diseases"). In 1868 Wilhelm Meyer of Copenhagen gave for the first time a complete picture of the condition under the name of adenoid vegetations. He had met with the condition in 1% of 2,000 school children examined in the national schools of Copenhagen. In this year also Luschka and Kollicker first described the normal pharyngeal tonsil. In 1879 Lowenburg published a very complete monograph on the disease "Tumeurs Adenoides du Pharynx Nasal."

111. Anatomy.

The organs under discussion occur normally as three masses of lymphoid tissue called Waldeyer's Ring.

1. The Faucial or Palatine Tonsils.
2. The Pharyngeal tonsil of Luschka, or third tonsil.
3. The Lingual Tonsil.

1. The Faucial Tonsils lie in the oro-pharynx, one on each side, in a cavity known as the sinus tonsillaris or tonsillar bed which is situated between the anterior and posterior palatine arches.

Each tonsil is an almond shaped body which varies in size in different individuals. In children it is relatively larger than in adults. It may be described as possessing two surfaces - an inner, or free surface, and an outer, or attached - and two poles - an upper and a lower.

The inner surface is that which is seen, on oral examination, projecting into the isthmus of the fauces. Its size, which varies greatly, cannot be taken as any indication of the size of the mass of tonsillar tissue. It is irregular in appearance, this is due to numerous (twelve to fifteen) small depressions - the orifices of the tonsillar crypts.

The outer surface of the tonsil is closely invested in a fibrous tissue capsule which sends its septa into the tonsillar substance. It lies in direct contact with the floor of the sinus tonsillaris or tonsillar bed, which consists from before backwards, of the palato-glossus muscle - forming the anterior faucial pillar, the superior constrictor of the

pharynx, and the palato pharyngeus muscle - forming the posterior faucial pillar. Above, the capsule is separated from its bed by loose areolar tissue - the peritonsillar space; below, it is closely blended with its muscular bed (Seccombe Hett, Lancet 1909 1. p. 457).

The upper pole of the tonsil is hidden on its inner aspect by a fold of mucous membrane - the plica semilunaris which crosses the angle formed by the junction of the pillars with the soft palate. Under cover of this plica is a large cleft, which was originally thought to be superior to the tonsil and was therefore termed the supra tonsillar fossa; it is now known to be situated within the upper portion of the tonsil and is termed the intra-tonsillar fossa or crypta magna.

The lower pole of the tonsil is in close relationship to the lingual tonsil. It is covered medially by a fold of mucous membrane - the plica triangularis, which stretches backwards from the anterior pillar to become lost on the surface of the tonsil. In an upward direction it covers a variable amount of the anterior surface of the tonsil.

External to the superior constrictor muscle, at the tonsillar level, lie the ascending palatine artery, the internal pterygoid muscle, which separates it from the ramus of the lower jaw, and the stylo pharyngeus and stylo glossus muscles, which, together with some loose areolar tissue, separate the constrictor from the internal carotid artery. The latter is about one inch distant from the deep tonsillar surface.

Blood Supply.

1. From the Facial Artery.

i. The Tonsillar Artery pierces the superior constrictor muscle near the lower pole of the tonsil. Here it divides into numerous small branches which enter the capsule and follow the trabeculae into the tonsillar substance.

ii. The Ascending Palatine branch supplies the anterior faucial pillar and also sends a branch which pierces the superior constrictor and penetrates the tonsil through the deepest part of the tonsillar bed.

11. From the Lingual Artery.

Branches from the Dorsalis Linguae. These reach the lingual surface of the tonsil and supply it and the anterior pillar and the plica triangularis.

111. From the Internal Maxillary Artery.

The descending Palatine artery supplies the posterior pillar and the upper part of the tonsil.

1V. From the Ascending Pharyngeal Artery.

This artery ascends well behind the posterior faucial pillar and sends several twigs to supply the tonsil; sometimes it is large and its pulsations can be seen when inspecting the pharynx (Irwin Moore, Practitioner, 1918, p. 387).

According to Leslie Davis (Laryngoscope, March 1914, quoted by Tilley) the arteries of surgical importance are the descending palatine branch and the ascending palatine branch. These form an anastomosis outside the fossa, the single artery then enters the fossa at the superior extremity and, passing downwards for about half an inch between the tonsillar bed and the capsule, pierces the latter to reach the tonsil.

Lymphatics.

The lymph vessels have their origin in plexuses

around the follicles of tonsillar tissue. They run in the fibrous tissue trabeculae to the capsule which they pierce. On the outer surface of the capsule they form a plexus from which several trunks arise which pass downwards towards the lower pole. They penetrate the superior constrictor to reach the upper deep cervical glands, and chiefly the gland which lies on the internal jugular vein under cover of the posterior belly of the digastric behind the angle of the lower jaw.

2. The Pharyngeal Tonsil is situated in the vault of the naso-pharynx. As,originally described by Luschka, it extends from the posterior boundary of the roof of the nasal cavity to the edge of the foramen magnum of the occipital bone, where it assumes a more or less uneven surface and is gradually lost on the posterior wall of the pharynx. According to Symington, it extends backwards and downwards from the posterior edge of the nasal septum to a point opposite the middle of the basi-occipital bone. Its upper and attached surface is in direct contact with the basi-occipital and basi-sphenoid bones and its full surface looks towards the upper two-thirds of the soft palate. It ends posteriorly in close relation with the upper border of the superior constrictor muscle. At this level the roof of the nasopharynx becomes continuous with the posterior wall, and below this level the pharynx is practically devoid of lymphoid tissue.

It is composed of six to eight parallel folds which pass in an antero-posterior direction and which are separated by furrows of varying depth. In the centre is a deep fissure known as the median recess or pharyngeal bursa.

The pharyngeal tonsil is distinctly visible to the naked eye during the later months of foetal life, and it usually increases gradually in size during the first six or seven years after birth. Not infrequently it begins to atrophy after this period. After puberty its rudimentary remains may alone be present or the roof of the pharynx may even be quite smooth.

Blood Supply.

1. Pterygo-palatine branch of the internal maxillary artery.

11. Ascending pharyngeal artery.

111. Ascending palatine branch of the facial artery.

Lymphatics.

Efferent vessels pass to the nearest glands in the deep cervical chain. Others pass to the retro-pharyngeal glands.

3. The Lingual Tonsil consists of numerous rounded projections of lymphoid tissue situated on the dorsum of the tongue and extending from the circumvallate papillae anteriorly to the epiglottis posteriorly. They are umbilicated in the centre and are provided with small crypts into which mucous glands open. Underlying their deep surface is a layer of connective tissue which blends with the capsule of the faucial tonsil (Seccombe Hett, ibid).

The lymphatics of the lingual tonsil pass with the dorsalis lingual artery to the deep cervical glands.

IV. Histology.

1. The Faucial Tonsil.

a. Epithelium lines the free surface. It is of the stratified type. The outer layers are of pavement cells and the deeper layers columnar.

b. The Crypts are recesses with apertures upon the free surface. They penetrate deeply into the tonsillar substance. They are lined with a prolongation of the stratified epithelium. Into them numerous mucous glands open.

c. The Fibrous Tissue Framework consists of trabeculae which pass into the substance of the gland from the capsule. It contains numerous blood vessels and lymphatics. It increases relatively to the lymphoid tissue with the age of the individual.

d. The Lymphoid Tissue, of which the tonsils are almost entirely composed, is diffused over the whole organ, but is at intervals aggregated into groups of lymphoid cells. These areas are rounded or oval and have a pale centre (the germ-centre of Goodsir) and a dark margin. The lymph cells may be observed to be passing through the epithelium on to the free surface, where they become mixed with the saliva as salivary corpuscles.

2. The Pharyngeal Tonsil.

This simulates histologically the faucial tonsil, with the exception that the epithelium is of the ciliated variety in conformity with the general type in this vicinity.

3. The Lingual Tonsil. Each nodule consists of a central crypt surrounded by numerous lymph follicles. It is covered by a stratified epithelium.

V. Development.

1. The Faucial Tonsil.

The inner part of the second visceral cleft becomes divided into two portions by the backward growth of the palate. The lower portion persists as the sinus tonsillaris. In the lower part of the sinus tonsillaris the hypoblastic epithelium becomes invaginated. The apex of the depression compresses the connective tissue, which is here condensed around the primitive alimentary canal. The original crypt branches and fresh ones appear. The connective tissue becomes vascularised and a massing of lymphocytes occurs. The lymphocytes increase in large numbers by mitotic division.

2. The Pharyngeal Tonsil.

The pharyngeal tonsil is developed in the same way in connection with the connective tissue thickening, which takes place around the median recess.

3. The Lingual Tonsil.

The posterior portion of the tongue is developed by the fusion of the ventral ends of the second and third visceral arches and the lingual tonsil is developed here in a similar manner to the faucial tonsil.

Vl. Physiology.

While there is no evidence to show that the tonsillar tissue has any specific function beyond that which is common to lymphatic glands in general, there is a mass of evidence to corroborate the opinion that by their position and their epithelial covering the tonsils have a very important part to play in the defence of the organism during the years of childhood and so long as they remain healthy. Their liability to acute and chronic inflammation in catarrhal conditions and in many and varied inflective processes; the fact that their enlargement generally precedes that of the cervical lymph glands; the emigration of lymphocytes through the epithelium; and experimental observation both with dyes and with micro-organisms all go to confirm this view. On the other hand no ill effects have been observed which could be definitely contributable to their removal when diseased.

Vll. Pathology.

1. The Essential Nature of the Lesion.

The lesion under discussion is essentially a two-fold one:-

a. A hypertrophy of lymphoid tissue.

b. A hyperplasia of the connective tissue elements.

In the early stages the tissue is soft and velvety to the touch. Later it becomes firmer from the increase of fibrous tissue. At the same time the lymphoid elements become reduced. On section at this stage the connective tissue trabeculae are visible to the naked eye.

The importance of these facts in regard to treatment is apparent when it is realised that severe haemorrhage is much more liable to occur in the later stages of development of the growths. After section the mouths of the blood vessels are held open by the connective tissue and are unable to retract within their sheaths as they do when the organs are soft.

The difference in the pathology of adenoids from that of enlarged tonsils is dependent on two sets of factors:-

a. The position and shape of the normal organs.

b. The greater liability of the faucial tonsils to attacks of acute inflammation.

2. The Faucial Tonsil.

Chronic enlargement of the faucial tonsil is generally described as occurring in three varieties:-

(1) Chronic Lacunar Tonsillitis.

(2) Chronic Parenchymatous Tonsillitis.

(3) Chronic Fibroid Tonsillitis.

These varieties, however, cannot be described as separate entities. All three elements are generally found in the same tonsil. What appears clinically to be a purely parenchymatous enlargement will frequently be found, on section, to contain the dilated lacunae filled with cheesy material, so characteristic of what is termed chronic lacunar tonsillitis. There is no dividing line and though it may be useful, practically, to designate the lesion by the predominant element, it should be realised that all are present in what may be generically termed "Enlarged Tonsils."

Naked eye appearances.

(a) In situ. The appearance of the enlarged tonsil as viewed per oram is variable. It may project so far into the isthmus of the fauces as to meet its fellow on the opposite side; on the other hand, it may be so hidden behind the anterior faucial pillar as to appear no more than its normal size, but in these cases it will be seen that the anterior surface of the faucial pillar is broader than normal and projects further into the mouth. Again, the enlargement may be more apparent than real, as Chassaignac ("Leçons sur l'hypertrophie des Amygdales"; p. 8; Paris 1854) pointed out, they seem to have undergone great enlargement owing to their being rotated forwards and inwards towards the median line. The enlarged tonsils may be definitely pedunculated or they may be flat and sessile. The latter is more frequently seen in the type in which the fibroid tissue element predominates. Sometimes one part of the tonsil - middle, anterior or posterior masses, or the lingual

prolongation - may predominate over the rest. In the majority of cases both tonsils are enlarged concurrently, though not necessarily to the same extent. Sometimes there are adhesions between the tonsillar surface and the faucial pillars and the pouches formed become filled with cheesy material.

(b) The Enucleated Tonsil. Externally is the shaggy thickened capsule, while internally the mouths of the enlarged crypts appear as slit-like openings out of which the yellowish cascous material may be compressed.

(c) On Section, the various elements are brought into view. In the lacunar type the dilated crypts are visible with their retained debris. This consists of epithelial cells, leucocytes, fatty matter, cholesterin crystals and bacteria; occasionally the contents of the crypts become consolidated into calcareous matter, or several crypts may communicate and become shut off and an abscess may form. The lacunar walls are thickened. In the parenchymatous variety the lymph follicles are increased in size and in number. The tonsil is soft and friable. In the fibroid type the septae become visible to the naked eye. In cases associated with tubercular glands in the neck histological evidence of tubercle in the tonsil is frequently found, and in other cases shewing no clinical signs of tuberculosis histological signs have been found in the removed tonsils.

3. The Pharyngeal Tonsil.

Chronic enlargement of the pharyngeal tonsil is designated "adenoids." The growth occupies a much greater

area of the nasopharynx than the normal situation of Luschka's tonsil. Anteriorly the posterior nares may be invaded. Laterally it may extend to the fossae of Rosenmüller, press upon the posterior lips or block the orifices of the Eustachian tubes. In extreme cases the whole of the space above the soft palate may be filled with the growth.

In younger children it occurs as soft friable masses in which the lymphoid elements preponderate. Later it becomes firmer and smoother and forms a well defined tumour in the pharyngeal vault. In young adults after some involution has taken place it may occur as a hard central cushion in which the lymphoid follicles have become almost entirely replaced by fibrous tissue. The fibrous tissue is first formed round the blood vessels which become partially occluded by it. It then invades the lymphoid tissue, areas of which become isolated, and are replaced by fibrous tissue.

The epithelium becomes thickened in places, the cilia disappear and squamous cells replace the columnar variety. (McBride and Logan Turner, quoted by St. Clair Thomson, Diseases of the Nose and Throat).

The furrows or clefts may contain caseous material which may have a foetid odour. Retention cysts may occur.

4. The Lingual Tonsil, when hypertrophied, shews the same pathological processes as those described above.

V11. Bacteriology.

1. Under Healthy Conditions.

Under healthy circumstances bacteria, which may always be found on the surface and in the crypts of the tonsils, may give rise to no trouble, but when the resistance of the individual is lowered local or general infection may result.

Dwyer found the following organisms present in 72 healthy subjects:-

Streptococcus	50
Staphylococcus	20
Pneumococcus	14
Micrococcus Catarrhalis	12
Bacillus Diphtheriae (true)	5
(pseudo)	5
(undetermined)	5
Bacillus Influenzae	5
Diplococcus Mucosus Capsulatus	4
Bacillus Pyocyaneus	1
Friendlander's Bacillus	1
Spirillum	1
Long-curved Bacillus	1

(Quoted by Pybus, Lancet, 1915, i, p. 1009)

2. After Removal for Hypertrophy.

Maclay, in 268 cases where the tonsils were removed for hypertrophy, found the following organisms:-

Staphyllococcus	166
Pneumococcus	121
Streptococcus	133
S. Haemolyticus	17
S. Viridans	1
Diplococci	49
Bacilli	5
Hay Bacilli	2
Tubercle Bacilli	1

(Quoted by J. S. Fraser, Journ. of Laryn. 1919. p. 209).

In thirty cases of enlarged tonsils associated with enlarged cervical glands, Gardiner (Lancet, 1915, ii. p. 752) found the following organisms. The deepest part of the gland, that next the capsule, was that examined.

M. Catarrhalis	7
Staphylococcus	5
Pneumococcus	7
Streptococcus	7
B. Coli	2
Tubercle Bacillus	4
Friendlander's Bacillus	1

3. Relationship of the Tubercle Bacillus.

The discovery of the tubercle bacillus is no criterion as to the presence of tuberculosis of the tonsil.

St. Clair Thomson (ibid) by tabulating the results of some twenty observers calculates that 5% or 6% of adenoid growths shew histological evidence of tuberculosis.

A. P. Mitchell (Journ. of Laryng. & Otol. 1918, p. 8) refers to 4934 cases in which the tonsils were removed for hypertrophy and examined by various investigators and of these 154 (3%) shewed histological evidence of tuberculosis. In 89 cases where the tonsils were removed for cervical adenitis 39 (43%) shewed primary tuberculosis of the tonsils. He himself in 100 cases of tonsils removed for hypertrophy found 9% tubercular. Of tubercular tonsils he found in 90% the bacillus was of the bovine type and in 10% human. He comes to the conclusion that tonsillectomy is essential in all cases of tubercular cervical adenitis in children.

Tilley (Diseases of Nose and Throat) refers to 762 tonsils removed by 10 different investigators. 6% to 7% were tuberculous.

Howarth and Gloyne (Lancet 1921, p. 997) considers that in cases of cervical adenitis the march of infection is from the tonsil towards the cervical glands, and that the correct surgical procedure would be removal of the tonsil rather than the cervical glands. If the tonsils are properly enucleated it will be found that in a large number of cases the glands tend to disappear.

IX. Etiology.

1. Age.

Adenoids are undoubtedly present at birth in a few cases. In conjunction with enlargement of the faucial tonsils the commonest age period is from three to fifteen. Both conditions may be present in adults either alone or in conjunction, thus, Tilley (Diseases of the Nose and Throat, p. 309) has removed large masses from the naso-pharynx at the ages of 35, 43 and 51. Enlarged faucial tonsils of the fibroid type are frequently found in adults.

I recently examined 200 children, all of whom had enlarged tonsils and adenoids to such an extent as to call for surgical intervention (Table A.) page 38 at the clinic of the Nottingham Education Committee. Their ages were as follows:-

Age.	Number.
3 - 4 years	1
4 - 5 "	11
5 - 6 "	48
6 - 7 "	66
7 - 8 "	17
8 - 9 "	7
9 - 10 "	14
10 - 11 "	8
11 - 12 "	8
12 - 13 "	8
13 - 14 "	8
14 - 15 "	4.

Priestley (quoted by Pybus, Lancet, 1915, i, p. 1065) found enlarged tonsils more common during the age periods 5 - 6, 6 - 9 and 12 - 14. These are the periods of eruption of the secondary teeth, but the coincidence is more probably due to the presence of caries of the first dentition during the first two age periods and of the first molars during the

last; for Pybus (loc. cit.) also quotes Wheatley, who found that of children at 5 years who had adenoids causing mouth-breathing, 16.7% more had dental caries than other children who had no adenoids, while at 12 years of age 22.7% more had dental caries.

My figures shew a remarkable predominance of cases during the earlier age period. This is probably due to several factors.

a. The teeth are now better cared for by the School Medical Service, and this is corroborated by Hamer in the Report of the Chief Medical Officer of the Board of Education, 1920, p. 91. He remarks on the improvement in the number of children at twelve years of age who have teeth free from caries, and the diminution in the proportion of children at that age who exhibit severe dental decay.

b. Cases of chronic enlargement of the tonsils and of adenoids are treated earlier and better than formerly.

c. Many parents are unaware that their children are suffering from enlarged tonsils and adenoids until they are examined by the School Medical Officers on their entrance to school.

2. Sex.

The sexes are equally affected. My figures were:-

Males.	Females.
95	105

3. Heredity.

Several children of one family are often affected and frequently a history can be obtained that one or other of the

parents was treated for the condition.

4. Contagion.

Leathart (B.M.J. 1920, i, 217) thinks that the disease is highly infectious. He says that school children are more commonly affected that those who do not go to school. When one child of a family is attacked the disease subsequently spreads to his brothers and sisters who were previously healthy.

5. Climate.

Several authors - St. Clair Thomson, Macleod Yearsley, Porter and others - point out that the condition is much more prevalent in low-lying, damp and cold districts than in higher, dryer and milder places. Sim Wallace (Lancet, 1921, ii, 1347) quotes Gradenigo who, in his clinic at Turin (a sub-alpine climate) found on the average one case in three, and Massein who, in Naples (a warm and genial climate) found only five cases in fifteen years.

6. Race.

Harry Campbell (Lancet 1921, ii, 1079) says that "adenoid disease is more common among the British than among any other people". This he attributes to their dietetic customs. Osler (quoted by St. Clair Thomson) says there are more mouth breathers to the acre in England than in any other country. On the other hand, St. Clair Thomson quotes Meyer, who shews that the Hebrew race is especially predisposed, and that the condition occurs "in the Esquimaux near the North Pole as well as the Malays on the Equator. The Negro, owing to wider nasal passages and lower hard palate, is but slightly

affected."

7. Infectious and Catarrhal Diseases.

Infectious and catarrhal diseases undoubtedly predispose to the condition. I have frequently noticed the enlargement commences immediately subsequent to measles or other illnesses in which catarrh is a prominent symptom.

In my series of 200 cases (Table A.) there was a history of definite infection of some kind in all but 14 (i.e. in 93%) and of these 14, in 10 there was a history of "frequent colds," and in only four could no previous history of infection be elicited. Merral (Lancet 1921, ii, 996) would have us believe that "the essential element in the causation of adenoid vegetation is the overworking of the lymphatic glands situated behind the soft palate by repeated colds and by the exanthemata," and the above figures would tend to confirm this opinion, but they represent only one side of the picture. As a control I questioned the parents of 30 children, (Table B) page 46 taken from the same schools, who had no indication whatever of having or of having had enlargement of the tonsils or of adenoids. The number is small but the satisfactory cases were difficult to find. They were all children who were being examined on an occasion subsequent to their examination as entrants. In no case had any enlargements been found in the course of the entrance examination. Of these 30 children all except two (i.e. 93.4%) had a definite history of measles or other catarrhal illness. It appears therefore that an antecedent history of infectious disease is not more common in the subjects of enlarged tonsils and adenoids than it is

in other children, and though such illnesses may be a contributory cause of the condition, they should not be styled the essential cause.

Nine of my series of 200 had previously had diphtheria (4.5%) and twelve (6%) presented symptoms or histories of acute rheumatism.

8. With regard to the Artificial Feeding of infants, there seem definite indications that bottle-feeding is a factor in the production of the enlargements. In my series of 200 cases 81 (40.5%) were bottle-fed, whereas in the control series of 30 cases only 3 (10%) were bottle-fed. There are several ways in which bottle-feeding might help to cause the growths:-

a. By infection from the teat.

b. By the high percentage of starch which many proprietary foods contain. According to Hector Cameron this is a prominent factor in the causation of the lymphoid state.

c. By the conveyance of bovine tubercular and other microbic infection from the milk.

9. Dental Caries is a prominent predisposing cause. Gibson (quoted by Macleod Yearsley, "Clinical Journal, 20th March, 1912) pointed out that if a few grains of aniline dye were placed on the last molar tooth in the lower jaw of one side, in about half an hour or less the upper surface of the tongue would be found stained in a triangular pattern - the apex opposite the tooth, and a slighter colouring of the dye would be noticed on the lower part of the pillars of the fauces and on the tonsil of that side. If the dye were placed on the tonsil no colouring would be seen, as a rule, in front of it on the gums or tongue.

Irvine Stewart (Lancet, 1909, i, 1872) examined 231

children with unilateral enlargement of the tonsil. 135 had dental caries and oral sepsis on the side of the enlarged tonsil; 67 had dental caries and oral sepsis on both sides; 16 had no oral sepsis at all and 15 had dental caries and oral sepsis on the opposite side.

In my series of 200 cases 88 (44%) had gross dental caries (several teeth obviously affected).

Pybus (ibid) quotes Jones, who noted a definite relationship between the percentage of enlarged tonsils and the number of carious teeth, thus:-

Carious Teeth	0	1-4	5 or over
Enlarged Tonsils	41.9%	52.8%	67%

One has frequently observed that after the teeth have received attention the enlargements have tended to diminish in size.

10. Shape of the Nose.

Packard (Osler and Macrae's System of Medicine) says that Kyle holds that the so-called inherited tendency to adenoids is frequently found in the inherited family nose, the hypertrophy of the glands in the naso-pharynx being more common in children whose nostrils have a narrow slit-like orifice than in those whose nostrils are wide open.

11. Dietetic Faults. Hector Cameron (Practitioner 1916, pp. 61, 137, & 246) and Harry Campbell (Lancet 1921, ii, 1079) consider that excess of sugar and soft starchy foods give rise to a status catarrhalis which is the precursor of adenoids, and it is certainly astonishing how frequently careful questioning will elicit the fact that the child of "strumous" appearance

is subsisting largely on a diet of chocolate, biscuits, bread and jam and other carbohydrates, while meat and oatmeal are conspicuous by their absence.

12. Bad Hygienic Surroundings predispose to the condition, which is more prevalent in the town than in the country.

13. Morel Mackenzie (Diseases of the Throat and Nose, Vol. ii, p. 494) notes the frequency of the occurrence of adenoids in cases of Cleft Palate and says that Meyer attributes this to the direct irritation to which the mucous membrane is subjected from food and cold air.

14. The Interralationship of Adenoids and Enlarged Tonsils.

Although it is an exaggeration to say that there is never enlargement of the tonsils without the presence of adenoids, yet in the majority of cases this association is present, and it is probable that the pharyngeal tonsil is primarily affected. The faucial tonsil may then become implicated in one or more of several ways:

a. There may be a direct extension of the catarrhal process from the adenoids.

b. The nasal obstruction causes mouth breathing, and the influx of unwarmed and unfiltered air against the tonsils renders them more liable to infection.

c. Mouth breathing renders the teeth more liable to microbial action and so they become a stage on the journey of the bacteria to the throat.

d. The faucial tonsil may receive afferent lymphatics from the nasal fossae and sinuses and thus become affected from the same source and more or less contemporaneously with the pharyngeal tonsil.

15. Summary and Correlation.

Summing up the etiology of enlarged tonsils and adenoids, one is forced to the same conclusion as Pybus (ibid) namely, that "the main factor in causing hypertrophy is infection, the infection resulting from the presence of organisms in the mouth and throat." The age at which the condition commonly arises is that before immunity has been attained. The climatic conditions and the unhygienic surroundings are such that the tissues become devitalised and form a ready medium for the growth and multiplication of bacteria. The source of infection may be contact with other children or more probably a self-infection occurs from the teeth or as a result of infectious or catarrhal illnesses. Artificial feeding adds to the risk of infection and at the same time renders the organism less fit to resist it. A badly shaped nasal cavity or one of small size fulfils most of the conditions acceptable to micro-organisms - it is warm, moist, dark and the air is stagnant, so that instead of being a highly specialised organ of respiration it has become a source of danger to the individual and the happy hunting ground for the growth and propagation of bacterial flora. Finally, malnutrition due to unsuitable feeding - especially in the form of too much carbohydrate - renders the child less resistant to the catarrhal state and causes the lymphoid tissue of the fauces and post-nasal space to become greatly magnified in an effort to prevent invasion of the tissues which may result in some permanent form of disease.

TABLE A.

Children with Enlarged Tonsils and Adenoids of such degree that Surgical Intervention was necessary.

Case No.	Age	Sex	Breast or Bottle fed	Carious Teeth	Previous Respiratory or Catarrhal Illnesses and age.
1	5	M	Bottle		None. (Rh.)
2	9	F.	Bottle	present	C.P. 5;M. 8.
3	6	M.	Breast		Frequent colds.
4	5	M.	Bottle		M. 4. (Rh.)
5	5	M.	Breast	present	M. 2; W.C. 3.
6	4	F.	Breast		M. 3; S.F. 3.
7	5	F.	Bottle	present	Br. 3 & 4.
8	7	M.	Breast	present	M. 5.
9	6	F.	Breast	present	M. 4.
10	5	F.	Breast		Pn. 2. (Rh.)
11	13	M.	Bottle	present	M. 5.
12	12	M.	Breast		M. 7.
13	13	M.	Breast	present	M. 8.
14	7	F.	Bottle		M. s. (Rh.)
15	4	F.	Bottle	present	Dip. 2. (Rh.)
16	5	F.	Bottle	present	M. 2.
17	5	F.	Breast		M. 2. (Rh.)
18	6	M.	Bottle		M. 3; S.F. 5; W.C. 5.
19	9	F.	Breast	present	M. 2; Dip. 7.
20	6	M.	Bottle	present	W.C. 2.
21	10	M.	Breast	present	Tonsillitis.

Case No.	Age	Sex	Breast or Bottle fed	Carious Teeth	Previous Respiratory or Catarrhal Illnesses and Age.
22	10	F.	Breast	present	Inf. 7; Tonsillitis.
23	8	F.	Breast	present	M. 5; Pn. 5.
24	5	F.	Breast		Pn. 4.
25	13	F.	Breast		M. 6; C.P. 7.
26	11	M.	Bottle	present	M. 8; Tonsillitis.
27	12	M.	Breast	present	Tonsillitis.
28	11	M.	Breast	present	M. 4.
29	7	M.	Breast	present	M. 4; & 6; (Rh.)
30	6	M.	Breast	present	M. 4.
31	11	M.	Breast		M. 1.
32	6	M.	Breast		M. 4.
33	11	F.	Bottle		M. 4.
34	6	F.	Breast		Pn. 4.
35	6	F.	Bottle		M. 4; W.C. 5; C.P.
36	12	F.	Bottle	present	M. 4: W.C. 4.
37	9	F.	Breast		M. L; W.C. 7; C.P. 6.
38	9	M.	Bottle		M. 6; S.F. Inf.
39	4	F.	Breast		Tonsillitis.
40	6	M.	Breast		M.2$\frac{1}{3}$.
41	6	M.	Bottle	present	Pn. 1.
42	8	F.	Breast	present	M. 2; W.C. C.P. (7 mths. child).
43	8	F.	Breast		Inf. 6.
44	7	M.	Bottle	present	M. 7; W.C. 7.
45	6	F.	Breast		W.C. 4.
46	6	F.	Breast	present	None.
47	6	F.	Breast		Frequent colds.
48	6	F.	Breast		M. 1; W.C. 2; Asthma.

Case No.	Age	Sex	Breast or Bottle fed	Carious Teeth	Previous Respiratory or Catarrhal Illnesses and Age.
49	13	M.	Breast	present	M. 1; Pn. 3.
50	5	M.	Bottle		Inf. $^{3}/_{12}$ (Rh).
51	6	M.	Bottle	present	M. 3; Inf. 5.
52	7	M.	Breast		M. 2; Inf. 6.
53	6	M.	Breast	present	C.P. 4; Dip. 4.
54	4	F.	Breast		M. 2.
55	9	M.	Breast		M.5.
56	9	M.	Breast		M. 7; W.C. 5.
57	6	F.	Breast		M. 3; C.P.
58	6	F.	Breast	present	M. 3; Pn.
59	7	M.	Breast		M. 4; W.C.
60	10	M.	Breast		M. 5; Pn.
61	6	F.	Bottle		M. 2.
62	5	M.	Breast		M. 2.
63	6	F.	Bottle		Pn. $^{10}/_{12}$; C.P. 5.
64	6	M.	Breast		M. 2; W.C. 4.
65	5	M.	Breast		M. 1; W.C. 4.
66	5	M.	Bottle	present	W.C.1.
67	6	F.	Bottle		M. 1; C.P. 3.
68	6	M.	Bottle	present	W.C. 3.
69	6	F.	Breast		W. C. 2.
70	6	F.	Breast		W.C. 5; Dip. 4.
71	6	F.	Breast		M. $^{11}/_{12}$
72	5	F.	Breast		M. 3; W.C. 3.
73	6	F.	Breast		Dip. 1.
74	9	F.	Bottle	present	M. 3.

Case No.	Age	Sex	Breast or Bottle fed	Carious Teeth	Previous Respiratory or Catarrhal Illnesses and Age.
75	9	M.	Breast		M. 2; W.C. 9.
76	5	M.	Breast		M. 3.
77	6	F.	Bottle		M. 4; Pn. 5.
78	13	F.	Breast	present	M. 1; W.C. 1.
79	5	M.	Bottle	present	M. 3; C.P. 4; Dip. 4.
80	5	M.	Bottle		C.P. 1; W.C. 1.
81	5	F.	Bottle		W.C. 4; C.P. 2.
82	5	F.	Bottle		None.
83	6	F.	Bottle	present	M.5.
84	6	F.	Breast	present	Inf. 3.
85	6	F.	Breast		M. $^{6}/_{12}$; W.C. $^{6}/_{12}$.
86	6	F.	Bottle		M. 2.
87	6	M.	Breast	present	W.C. 2.
88	6	F.	Bottle	present	None.
89	5	M.	Breast		M. $^{9}/_{12}$; W.C. $^{3}/_{12}$.
90	7	M.	Breast		C.P. 6.
91	6	F.	Bottle	present	M.4.; C.P.3.
92	4	F.	Bottle	present	Frequent colds.
93	5	M.	Breast		W.C. 4; Inf. 5.
94	6	M.	Bottle	present	W.C. 4;
95	5	F.	Bottle		M. 4; Pn. 4.; W.C.1.
96	4	F.	Breast		M. 3.
97	7	F.	Bottle	present	M. 5.; W.C. 6.
98	5	F.	Breast		M.3.; C.P.4; Mumps 3.
99	6	F.	Bottle		M.3.; W.C. 4.
100	7	M.	Bottle	present	M.4.; C.P. 6.

Case No.	Age	Sex	Breast or Bottle fed	Carious Teeth	Previous Respiratory or Catarrhal Illnesses and Age.
101	6	F	Breast		M.1.; W.C.3.
102	14	M	Breast		M.2/12.
103	5	M	Breast	present	Inf. 5.
104	6	M	Breast		M.2.; Inf.2.
105	5	M	Bottle		W.C.2.
106	11	F	Breast		M.5.; C.P.7.
107	6	F	Breast		M.4.; C.P.2.
108	5	M	Breast		M.4.;S.F.4; W.C. Pn.
109	5	F	Breast	present	M.$^{3}/_{12}$; Pn.$^{3}/_{12}$.
110	6	F	Bottle		M.1.
111	6	M	Breast	present	M.1.; W.C.1. Asthma
112	5	F	Breast		M.3.; Pn. W.C.3.
113	10	M	Bottle	present	M.5.
114	6	M	Bottle	present	M.1. Pn. (Rh.)
115	7	F	Bottle		M.2.
116	7	M	Breast		M.5.; W.C.4.
117	5	F	Bottle	present	M.1.; W.C.$^{8}/12$; Inf. 3.
118	6	M	Breast	present	M.4.; C.P.5.
119	6	M	Bottle		M.1.; W.C.$^{10}/_{12}$.
120	6	F	Breast	present	M.3.; Inf.4.
121	5	F	Bottle		M.2.; S.F.3.; Pn. Dip.5.
122	6	M	Breast		M.5.
123	6	F	Breast		Tonsillitis 5.
124	5	M	Bottle	present	M.3.
125	13	F	Bottle	present	M.5.
126	5	M	Breast		M.3.

Case No.	Age	Sex	Breast or Bottle fed	Carious Teeth	Previous Respiratory or Catarrhal Illnesses and Age.
127	7	M	Breast		Frequent colds.
128	14	M	Breast	present	M.3. W.C.4.
129	5	M	Breast		M.4.
130	5	F	Breast	present	M. 9/12
131	8	F	Bottle	present	Frequent colds.
132	4	F	Bottle		Bronchitis.
133	6	M	Breast	present	M.4. Pn.
134	8	M	Breast		M.3. Tonsillitis 7. (Rh.)
135	6	M	Bottle	present	M.1. W.C.5.
136	11	F	Bottle	present	M.5. Inf.
137	5	M	Bottle		S.F.3.; Dip.3.
138	5	M	Breast		W.C.1.
139	5	M	Bottle	present	Bronchitis.
140	6	F	Breast	present	W.C.
141	6	F	Breast	present	Frequent colds.
142	7	M	Bottle		M.5.; W.C.6.
143	7	M	Breast	present	M.1.
144	5	M	Breast		M.2.
145	4	M	Breast	present	Inf. 3.
146	8	F	Breast	present	M.1. Dip.5.
147	12	F	Breast		M.5.
148	14	M	Breast	present	M.7.
149	5	F	Bottle		Bronchitis 3/12.
150	5	F	Breast	present	M.3. Bronchitis every winter.
151	4	F	Breast		Frequent colds.
152	6	M	Breast	present	M.2.; S.F.4.; C.P.4.

Case No.	Age	Sex	Breast or Bottle fed	Carious Teeth	Previous Respiratory or Catarrhal Illnesses and Age.
153	13	F	Breast		M.9. S.F.9. (Rh.)
154	8	F	Bottle		M.1.
155	7	M	Bottle	present	M.5. W.C.3.
156	6	F	Bottle		W.C.5.
157	6	F	Bottle	present	M.2.
158	4	M	Breast		C.P.
159	6	M	Breast	present	M.$^{3}/_{12}$
160	13	F	Bottle	present	M.1.
161	12	F	Bottle	present	M.3. S.F.10. W.C.2.
162	7	F	Breast		Bronchitis.
163	6	M	Breast		M.3.
164	6	M	Bottle	present	M.3.
165	5	F	Bottle		Tonsillitis.
166	10	M	Breast		M.3.; W.C.4.
167	7	F	Breast	present	Frequent colds.
168	5	F	Bottle		W.C.4.
169	6	M	Bottle		Inf.4.
170	3	M	Bottle		Pn.1.; C.P.3.
171	6	F	Breast	present	W.C.4.
172	9	F	Bottle		M.8.; W.C.9.
173	5	F	Breast	present	M.4.
174	12	F	Bottle	present	M.1.; S.F.1.
175	5	F	Breast	present	M.3.; S.F.4.
176	6	M	Breast		Frequent colds.
177	10	F	Breast		M.$2\frac{1}{2}$
178	5	M	Bottle	present	M.3.

Case No.	Age	Sex	Breast or Bottle fed	Carious Teeth	Previous Respiratory or Catarrhal Illnesses and Age.
179	6	F	Bottle	present	Frequent colds.
180	5	M	Bottle		M.3.; W.C.4.
181	9	F	Bottle		M.6.
182	12	M	Breast	present	M.8. (Rh.)
183	9	F	Breast		M.5.
184	9	M	Breast		M.2.; Pn.7.
185	11	F	Bottle		M.6.; Pn.2.
186	6	M	Bottle		M.2.
187	6	M	Breast		M.3.
188	9	F	Bottle	present	M.4. S.F.5.
189	5	F	Breast		M.2.
190	8	F	Breast	present	M.4.
191	9	M	Breast	present	C.P.6.
192	10	F	Bottle		M.8.
193	6	F	Breast		M.3. Pn.3.
194	11	M	Bottle	present	M.7.
195	10	F	Bottle	present	W.C.9.
196	6	M	Breast		M.3.
197	5	F	Breast	present	M.1.
198	12	F	Breast		M.7.
199	5	M	Breast	present	M.2.
200	4	F	Breast	present	M.4.

Pn. = Pneumonia
Inf. = Influenza.
M. = Measles
C.P. = Chicken Pox.
W.C. = Whooping Cough
S.F. = Scarlet Fever
Dip. = Diphtheria.
Rh. = Rheumatism.

TABLE B.

Healthy Children presenting no Sign of Enlarged Tonsils or Adenoids.

Case No.	Age	Sex	Bottle or Breast	Previous Illness.
1	9	F	Breast	M.1.
2	7	F	Breast	M.3.; Pn.
3	8	F	Bottle	M.4. Frequent colds.
4	8	F	Breast	None.
5	8	F	Bottle	M.3.
6	8	F	Breast	M.4.
7	8	F	Breast	M.2.;W.C.4.
8	8	F	Breast	M.1.; W.C.2.
9	8	F	Breast	None.
10	7	F	Breast	M.3.
11	9	F	Breast	M.5.
12	8	F	Breast	M. 3/12.; C.P.; W.C.7.
13	8	F	Breast	W.C.8.
14	12	M	Breast	M.2.; W.C.2.
15	12	M	Breast	M.5.
16	12	M	Breast	M.6. W.C.6.
17	13	M	Breast	M.2. W.C.4.
18	12	M	Breast	M.7. Small Pox 11.
19	13	M	Breast	M.5. S.F.5.
20	12	M	Breast	M.3.
21	12	M	Breast	M.4.
22	13	M	Breast	S.F.5.

Case No.	Age	Sex	Bottle or Breast	Previous Illness.
23	12	F	Breast	M.3.
24	14	F	Breast	M.3.
25	12	F	Breast	M.2.
26	12	F	Breast	M.3. Frequent colds.
27	13	F	Breast	M.3.
28	12	F	Bottle	M.3. S.F.4. Dip.10.
29	11	F	Breast	M.5. Dip. 10.
30	12	F	Breast	M.2. W.C.2.

X. Pathogenesis.

There are three principal theories as to the cause of hypertrophied tonsils and adenoids.

1. That it is a chronic infective condition due to invasion of the normal lymphoid structures by microorganisms.

2. That it is part of a "status lymphaticus" brought about partly by predisposition and partly by a diet which contains too much carbohydrate ("starchy diathesis")

3. That it is a protective reaction on the part of the organism against recurring infection. (Kenelm Digby and others.)

The last mentioned theory has much in its support. Bacterial activities are at their greatest in the fauces and nasopharynx and it is during the period when the organism is gaining immunity from these attacks that the tonsils tend to enlarge and the adenoids to manifest themselves. The tonsils, far from being vestigial organs, have been shewn by Seccombe Hett to be more highly developed in the higher forms of life. The association of the condition with dentition - referred to by many writers - when catarrhal conditions of both the respiratory and the alimentary tract are notoriously prevalent and the tendency to atrophy at, or soon after, puberty, when the necessary immunity has been acquired, all go to support this view. The absence of afferent lymphatics (unless from the nasal cavities) and the demonstration of wandering cells on the surface of the tonsils still further confirm the opinion that these structures are vitally concerned in the protection of the individual from infection and that the simple or

parenchymatous enlargement is an endeavour on their part to strengthen the defences of the organism. The interstitial and the lacunar elements in the condition may well be secondary effects.

If this theory be the true one then it is inadvisable to totally extirpate the tonsils unless, in the case of simple enlargement, they are causing marked mechanical obstruction or, in the case of chronic lacunar tonsillitis, they are instead of a protection, an active source of danger to the individual.

Xl. Treatment.

1. Introduction.

Theoretically the line of treatment in cases of enlarged tonsils and adenoids must depend on the attitude of the practitioner to the pathogenesis of the disorder. If it be his opinion that the enlargement is a physiological condition brought about for the better defence of the organism he will use every means in his power to alleviate any symptoms which may result by general hygienic and medicinal measures even to the risk of leaving permanent defects behind. If on the other hand, it be his opinion that the enlargements are new growths of purely pathological significance he will tend to adopt surgical measures on the manifestation of the earliest symptom of the disease, and, moreover, he will use every means in his power totally to eradicate the growths.

It is an undoubted fact that, of recent years, too many "tonsil and adenoid operations" have been performed, and frequently by surgeons who have had little or no experience in the technique of the operation. Thus an operation which has a very useful and definite purpose to fulfil has been brought into bad repute and a loophole has been left for the administration of unscientific methods of treatment.

The concensus of opinion seems to be that a middle course is the correct one to pursue.

2. Prophylaxis.

Too little has been said with regard to this aspect of the subject. Sufficient is known of the etiology to guide us very considerably on this point, and with the efficiency to which the School Medical Service has now attained much might be done to prevent the more serious degrees of the condition.

a. The teeth should receive proper attention from the earliest years. Parents must be made to realise that the care of the first dentition is as essential to the health of the child as that of the second is to the adult. Regular examination by a properly qualified dentist and early treatment when needed must be insisted upon.

b. The child must be educated in nasal hygiene, especially in regard to proper blowing of the nose. Many children may be observed to apply the handkerchief to the nose and then sniff so that the mucus is carried back into the nasopharynx instead of outwards to the receptacle. Each nostril should be blown separately, the other being compressed with the finger.

c. Many colds and cases of exanthemata might be avoided or their effects minimised under more careful supervision and thus a frequent source of the condition might be eliminated.

d. Although the opinion of Hector Cameron (Practitioner 1916, pp. 61, 137 and 246) and Harry Campbell (Lancet 1921, p. 1079) that a starchy diet is a predisposing cause of the disease is difficult of proof there is much

evidence in favour of it. Children do much better on a diet containing meat than on one without it. Meat, minced and somewhat undercooked, may with advantage be introduced into the dietary at the eighteenth month.

e. Nasal breathing must be inculcated, if necessary by means of respiratory exercises; though suitable clothing and fresh air are usually sufficient to initiate the practice.

f. The frequency with which the bovine tubercle bacillus has been found demands the closest attention to the milk supply for the young.

3. Treatment.

Cases where definite hypertrophy is established may be divided, as regards treatment into four groups.

a. Slight cases which present no symptoms but which are discovered in the course of a routine examination. (GROUP I)

b. Cases of moderate severity in which there is a slight degree of nasal obstruction and the tonsils are moderately enlarged. (GROUP II)

c. Cases presenting chronic nasal obstruction with any or several of the following accompaniments:-

i. Mouth breathing during the day time.

ii. Eustachian obstruction - either from catarrh or pressure of the growth.

iii. Commencing opacity of the tympanum or any middle ear complications.

iv. Rheumatic symptoms associated with chronic tonsillitis.

v. Frequent attacks of tonsillitis or

peritonsillitis.

vi. Chronic nasal catarrh or rhinitis.

vii. Chronic enlargement of the cervical glands.

viii. Commencing thoracic deformity.

ix. Ill health definitely due to septic absorption from the tonsils.

x. Cases of the second group which do not improve under treatment.

d. Cases in Group III in which operation is contraindicated. (GROUP IV)

Group 1.

The parents should be informed of the condition and advised as to hygienic measures which may improve the child's health. These measures are indicated in the remarks on prophylaxis. The child should be examined every six months so that any further development may be appropriately treated.

Group II.

The above measures should be adopted and in addition:-

1. Change of air to seaside or a high altitude.
2. Medicinal measures such as the iodide of iron, extract of malt and cod-liver oil.
3. Local treatment.

(1) The Tonsils.

A multitude of medicaments have been tried from time to time in the desire to reduce enlarged tonsils without operation. When these have settled down to a definite enlargement of big dimensions they are of little avail, but

the following may be tried in this group of cases:

Solution of perchloride of iron - this may be prescribed as a gargle; or it may be painted on the tonsils once or twice daily; or it may be given as a medicine "to be gargled before swallowing." The swallowing act brings it into closer contact with the tonsils and in addition the iron is of value medicinally.

Mandl's paint of iodine, potassium iodide, oil of peppermint and glycerine help to lessen the liability to recurrence of tonsillitis and thereby favours a reduction of the enlargement.

Such mild astringents as alum and tannic acid never cause any reduction of the gland structure (Irwin Moore, Journ. of Laryng. & Otol. 1919, p. 387).

(2) The Adenoids.

The associated catarrh is frequently benefitted by the use of alkaline lotions which the child is directed to "drink through his nose and spit out through his mouth" (Still, "Common Disorders, and Diseases of Children" p. 324). Such lotions usually consist of the bicarbonate, the biborate and the chloride or soda gr. V - X of each to the ounce of water with or without the addition of glycerine.

Another method is to lay the child on his back and drop a few drops of lotion into the nares. For this purpose St. Clair Thomson uses Oil of Peppermint, .5; Resorcin .25 and Liquid Vaseline to 10 parts; or, Iodine gr ½, Camphor gr 1, Menthol gr 1 and Liquid Vaseline 3i I have found the latter to be of considerable service.

An atomiser containing oil of Eucalyptus and Liquid Paraffin, with or without Menthol, or Liquid Iodex may be used for the same purpose.

4. It cannot be too emphatically laid down that appropriate dental work and the removal of oral sepsis at this stage will frequently prevent the child from going on to Group 111.

5. Nasal drill.

The children are taught, as a class, to blow their noses, one nostril at a time, into pieces of soft paper. They are then given a pinch of snuff composed of menthol in a soap basis. This is not sniffed up but lightly flicked against the nasal septum. Sneezing is thereby induced. The nose blowing is resumed. The sneezing and nose blowing are then continued alternately until the discharge from the nostril ceases or becomes scanty. Lastly, nose breathing exercises are performed. Although Hickling was able to report an improvement in the general condition, carriage and health of the children there was little if any effect on the size of the growths, but she thinks the method might prove of service in slight cases, cases after operation, and cases inoperable on general grounds, as a prevention to the disorder and as a post-operative procedure.

GROUP 111.

In this group surgical intervention is definitely indicated. But this statement by no means terminates the controversy. The question now arises whether the enlarged faucial tonsils should be removed in whole (tonsillectomy) or in part (tonsillotomy, or partial tonsillectomy); and, if in whole, should they be dissected out or should they be enucleated with the guillotine?

1. Tonsillectomy or tonsillotomy.

Since the improved technique of the operations for removal by the guillotine by the Whillis-Pybus method or by dissection by the Waugh method was introduced there has been a great reversion in favour of the total operation, but a good technique in itself is not sufficient indication for a certain line of treatment. The following reasons may be cited in favour of:

(a) Removal by tonsillotomy.

(b) Removal by tonsillectomy.

(a) For removal by tonsillotomy.

i. Many thousands of operations have been performed with complete relief of symptoms and with no recurrence.

ii. The more radical operation is more dangerous on account of:

A. The deeper degree of anaesthesia necessitated.

B. The greater haemorrhage.

C. The increased liability to injure the faucial pillars.

iii. The protective function of the glands and especially

of the capsule should not be abolished.

iv. The operation can be more easily performed and requires less skill and therefore more cases could be benefited than is possible with the radical operation.

v. It is unlikely to alter adversely the singing voice.

(b) For removal by tonsillectomy.

i. It is a certain and complete operation and there is no recurrence.

ii. The deepest part of the tonsil is frequently found to be diseased.

iii. There is no definite evidence that any ill-effects follow the complete removal of the glands.

iv. No tonsil being existent, there is no peritonsillar space, and therefore there can be no quinsies.

v. In the hands of a skilled anaesthetist and a skilled surgeon the dangers of shock, haemorrhage and injury to the faucial pillars are reduced to a minimum.

vi. A diseased tonsil is rather a source of infection than a protection from it.

The majority of surgeons are inclined to the view that tonsillectomy is the operation of choice but that in singers tonsillotomy is preferable. It may reasonably be added that where the septic element in the enlargement is absent tonsillotomy should be performed if the enlargement interferes with swallowing or speaking. Where the pharyngeal tonsil is alone affected, the faucial tonsils should not be removed without definite indications that

removal is necessary.

2. Methods of Enucleation.

The two chief modern methods of removal of the tonsils are:

(a) Enucleation by guillotine, using the Whillis-Pybus method or modification.

(b) Enucleation by blunt dissection throughout.

Removal with the cold wire snare and the galvano cautery snare are rarely resorted to. Laurens and other French writers still advocate removal by morcellement, using Ruault's forceps. The operation is done under local anaesthesia with which the tonsil is rubbed. The patient is seated on a chair. The tonsil is bitten out in pieces, commencing at the lower pole. The operation may be completed in one or several sittings.

The advantages of the guillotine operation are:-

(1) Its simplicity and the readiness with which its technique may be acquired.

(2) The rapidity with which the tonsils may be completely removed.

(3) The whole operation is under direct vision.

It is the method of choice in children and in adults with pedunculated tonsils. Howarth (Lancet, 1916, ii, p. 600) says it is applicable to 70% of cases in adults. Ballenger, (Diseases of the Nose, Throat and Ear) says it can be used in 75% of cases and quotes Sluder who claims 99% of successes. Milne Dickie (Journ. of Laryng. & Otol.

1914, p. 184) obtained 93% of complete anatomical enucleations by this method.

The advantages of enucleation by dissection are:-

(1) It is applicable to all cases.

(2) It ensures complete removal by a thoroughly surgical procedure.

(3) Haemorrhage is completely under control.

(4) There is less liability of injuring the faucial pillars.

It is the operation of choice in adults with flat tonsils and of necessity where there are many adhesions to the faucial pillars or where previous tonsillotomy has left the anatomical relationships undefined. Howarth (ibid) considers it should be resorted to in 30% of cases. Hill (practitioner 1918, p. 301) thinks it is the operation of choice in most adults.

To summarise this question of the method of operation the following generalisations may be laid down.

1. Where there is marked nasal obstruction the adenoids should be removed.

2. Where the tonsils are enlarged and are causing mechanical difficulties with a good deal of mucous discharge they should be clipped off level with the faucial pillars.

3. Where the tonsils are definitely septic or are the cause of disturbance in other parts of the body - tubercular cervical adenitis, rheumatism, etc., they should be enucleated by the guillotine in children and by dissection in adults.

3. Preparation of the Patient.

There are three important considerations which must be taken into account before proceeding to subject any patient to operative treatment.

a. It must be determined that he is not a haemophilic subject. If there is any doubt, the index of coagulability of the blood should be ascertained. It is better to abstain altogether from operating on a haemophilic subject but if the operation is essential a course of prophylactic measures against haemorrhage must be undertaken. The injection of horse serum (10-25 cc.) the administration of calcium lactate (15 grains twice daily) or the transfusion of blood from a suitable donor are amongst the methods available for this purpose.

If the patient is not a "bleeder" but is, nevertheless, anaemic, or if, for any cause, it is essential that the loss of blood should be reduced to a minimum a course of calcium lactate and coagulose (haemostatic serum) should be prescribed.

The value of pituitrin as a prophylactic against haemorrhage in tonsil and adenoid operations has been advocated by Citelli, Kahn and Gordon (Quoted by Irwin Moore, Practitioner, April 1918, p. 34). On the other hand Donelan (Journ. of Laryng. & Otol. 1913, p. 353) found little use for the method, though he thought it might be useful to support the heart and obviate shock.

Most observers agree that adrenalin predisposes to secondary haemorrhage.

b. The glands should be removed when they are in the "resting stage." They must not be removed during an attack of acute tonsillitis, or acute otitis media. The tendency to both haemorrhage and sepsis would be greatly increased if this contraindication were neglected.

c. The teeth must receive treatment before the operation is attempted. It is frequently found that after the teeth have been thoroughly overhauled there is no need for operative treatment - the enlargements have diminished in size.

The presence of infectious disease in the home of the child is also an indication for postponing the operation.

The patient should have his bowels cleared out the day before the operation and no solid food should be given on the morning of the operation.

O'Malley (B.M.J. 1913, i., p. 699) recommends the following mixture to be given one day previously to the operation and six days afterwards:

℞ Sodii Salicyl.
Potas. Bicarb.
Potas. Chlorat. — aa grs. X
Elixir Aromat. (B.P.C.) — m XX
Aq. Chloroform — ad ℥ij

Dose - Under 6 years ℥ i
6-12 years ℥ ii

4. Environment.

The execrable conditions under which the operation was performed but a few years ago have caused the Chief Medical Officer of the Board of Education (Annual Report 1920

p. 73) and, latterly, the Council of the Section of Laryngology of the Royal Society of Medicine (Lancet 1922, i., p. 662) to speak in no uncertain voice of the importance of suitable provision for patients submitted to operation. E. Watson-Williams (B.M.J. 1920, ii. p. 887) found that the liability to morbidity after the operation - acute suppurative otitis, mastoiditis, etc. - was four times as great in out patients as in in-patients, and it is now accepted as a tenet that wherever possible the patient should be detained in hospital for at least forty-eight hours after the operation. Where this is not possible, a proper recovery room, warm, well-ventilated, and with a separate bed for each patient should be provided. The child should be removed home in an ambulance or hired conveyance and not in a public 'bus, tram or train.

Where the operation is to be performed at home the room should be prepared as for a major operation. Absence of dust must be ensured at the time of, and for several days subsequent to the operation.

5. The Combined Operation for Removal of the Tonsils (by the Whillis-Pybus method, or modification) and the Adenoids.

a. The position of the patient.

Whatever method of operation is used, it is absolutely essential that the tonsils should be in full view of the operator so that injury to the uvula and faucial pillars should be avoided and undue haemorrhage dealt with. If daylight cannot be obtained, a frontal searchlight may be used. The table should be placed

parallel to the window with the patient lying on his back and with his right side to the window. The operator stands between the patient and the window. When the tonsils have been removed the patient may be turned on the right side to facilitate the ejection of blood, or the head may be lowered over the end of the table throughout the operation (Porter). O'Malley (B.M.J., 1913, i., p. 699) considers that when the adenoids are to be removed, the head should be flexed by the operator's left hand placed on the occipital region of the patient's head. This flexion diminishes the prominence of the body of the axis and makes the naso-pharyngeal curve more even.

b. The Anaesthetic.

It is generally admitted that, in order to enucleate completely the tonsils and excise the adenoids, a general anaesthetic is necessary, though in Germany the operation is invariably done without anaesthesia (Porter). The safest anaesthetic to administer is probably open ether, but the large amount of mucous secretion which attends it will sometimes interfere with perfect vision of the area. In order to avert this it is advisable to inject hypodermically $\frac{1}{100}$ to $\frac{1}{150}$ gr. of Atropine half-an-hour previously. Some prefer chloroform followed by ether or vice versa, and others again use the C.E. mixture. Probably the most popular anaesthetic is ethyl chloride. Carefully administered this rarely gives rise to trouble and allows of ample time for the expert to complete the operation. Gas and Oxygen anaesthesia is also used. More important than

the anaesthetic is the complete co-operation between the anaesthetist and the surgeon. The anaesthetic should be carried just so far that the coughing reflex is lost for the period necessary for the operation, but quickly recovers thereafter.

c. Instruments required.

There are numerous modifications of Mackenzie's guillotine, any one of which may be suitable for the operation. There are two points of importance for the adequate performance of the operation.

1. The cutting blade must be blunt.
2. The ring of the instrument must be sufficiently small.

Charles Heath's instrument is simple and fulfils the necessary requirements. The shaft is long and stout and is not complicated by any mechanism which may get in the way. The handle, which is heavy, is set at right angles to the shaft. Ballenger uses a guillotine with scissor action handles which have a ratchet device, whereby slipping is prevented. O'Malley's instrument also has scissor action handles and the slot in the ring which receives the blade is filled in with lead on which the blade cuts. The ring with an internal diameter of $\frac{3}{4}$" will be found to meet most requirements; occasionally a smaller ring may be used, rarely a larger one is necessary.

Elphick in this country and La Force in America have introduced instruments with two blades. The outer blade is blunt and crushes the pedicle of the tonsil while the inner one is sharp and shaves it off. The instrument is

called the "haemostatic guillotine." Tilley (Diseases of the Nose and Throat, p. 433) fails to see any advantage in these devices. The operation takes almost as long as enucleation by dissection, it is less bloodless and is more liable to destroy certain portions of the faucial pillars.

Some modification of Doyen's gag is generally used. It should be applied to the lateral teeth, as far back as possible and on the left side. It can be left in this position until the operation is completed.

No tongue depressor is necessary or advisable. If the tongue is large and obstructs the view, a silk suture may be passed through it, and this is drawn upon by an assistant.

For the adenoids some modification of the Gottstein curette is the most popular instrument. Delstanche's and St. Clair Thomson's both have cages containing hooks which grasp the growths and so prevent them from falling into the throat. Many surgeons use a caged curette for the central mass and an unguarded one for the lateral portions of the adenoids. Others again prefer some modification of Lowenburg's forceps of which Juracz's is the most useful (Tilley), but the soft palate, uvula and Eustachian cushions are not altogether free from danger with these instruments.

A large number of instruments have been invented for the purpose of dealing with serious haemorrhage from the tonsillar bed, should such arise. Perhaps a long pair of ordinary pressure forceps is the most useful instrument. A Watson-Williams tonsillar haemostat is rarely tolerated unless the patient be anaesthetised, but it may be used

temporarily while other measures are being prepared. Irwin Moore has had instruments made for the somewhat unsurgical procedure of temporarily stitching the faucial pillars, while Wagner has introduced a special instrument for the application of Michel's clips.

Sponges in sponge-holders must be available.

d. Technique.

The patient's head is turned slightly to the right and the guillotine is passed, like a tongue depressor, along the surface of the tongue. The ring is made to engage the lower pole of the right tonsil. The handle of the guillotine is now carried towards the left side of the patient's mouth and at the same time the hand is pronated so that the ring comes to press upon the whole tonsil in a forward and outward direction. This causes the tonsil to bulge through the front of the anterior pillar. This swelling is pushed upon by the left index finger in order to invaginate the tonsil through the ring of the guillotine. The blade is now pushed home until it engages the pedicle of the tonsil. The handle is then carried over to the right side of the mouth in order to lever the tonsil out of its bed. The blade is now completely driven home, the pedicle is cut and the instrument is withdrawn bearing the tonsil with it. The left tonsil is then removed in the same manner, either by using the guillotine with the left hand or by stepping nearer the head of the patient and using the right hand.

The tonsils having been removed it is advisable to introduce the finger of the left hand into the post nasal space in order to ascertain the magnitude of the growth of

adenoids. The finger will also serve as a guide to the introduction of the curette. The instrument is passed upwards behind the soft palate along the posterior edge of the septum until it firmly engages the mass in the roof of the pharynx. The handle is now elevated and with one sweeping movement the roof and posterior wall of the pharynx are cleared of the growth. In some cases this is sufficient to remove the whole mass. In others it is necessary to remove the lateral portions with an unguarded or with a lateral curette. In all cases the finger should again be inserted in order to make sure that all the vegetations have been removed. If the patient has been lying on his back throughout the operation, he should now be turned on his side and the face and head well douched with cold water. This procedure usually stops all haemorrhage. If ethyl chloride has been administered he may be raised to the sitting position which helps further to arrest the bleeding.

Sluder's method of dealing with the tonsils differs from the above in that the tonsil is pressed with the guillotine against the bony prominence, on the inner aspect of the lower jaw, caused by the last molar tooth. This "alveolar eminence" is used instead of the index finger to push the tonsil through the ring of the guillotine.

St. Clair Thomson uses the tonsillotome in the reverse direction - the handle towards the tonsil to be removed. A vulsellum forceps or Hartmann's conchotome is passed through the ring of the instrument so as to seize the tonsil and drag it out beneath the blade.

The tonsils should be examined as soon as the

operation is completed in order to make sure that they have been completely removed. The lower pole is that which is most frequently left behind.

e. Haemorrhage.

The chief dangers of the operation are the anaesthetic and haemorrhage. Serious haemorrhage is rare but when it does occur it may be of serious import.

i. Causes of haemorrhage. (Irwin Moore, Practitioner, April 1918, p. 342).

Predisposing.

1. Acute inflammation of the tonsil.
2. Anaemia and leukaemia.
3. Cardiac and renal diseases.
4. The menstrual period and pregnancy.
5. Age - adults rather than children.
6. Sex - males more than females.
7. Haemophilia and purpuric diseases.
8. Fibroid tonsils.
9. Malignant disease.
10. Abnormalities in size, or irregular distribution of blood vessels of tonsils or adjoining parts.

Exciting.

1. Traumatism - due to clumsy manipulation and faulty technique in unskilled hands.
2. Exertion too soon after operation - coughing, vomiting, eating, the erect position.
3. Local anaesthesia, e.g. cocaine and adrenaline predisposing to secondary haemorrhage.

ii. Frequency of Haemorrhage.

Ballenger reports two cases, out of 9,000 operations,

Milne Dickie nine cases out of 7,133 tonsillectomies, Cocks (Proc. New York Acad. Med. Feb. 1912, quoted by Irwin Moore, Practitioner, April 19, 1918, p. 338) found in the literature a total of 107 cases of post operative haemorrhage after complete tonsillectomy with thirteen deaths. Authorities differ as to the relative frequency of haemorrhage in partial or complete removal, but the concensus of opinion is that haemorrhage is greater after complete enucleation than after partial tonsillectomy.

iii. Treatment of Haemorrhage.

Some surgeons think that the bed of the first tonsil removed should be completely dry before proceeding to the second one, but it is generally found that the haemorrhage will cease spontaneously if the above mentioned measures are applied. Should the bleeding continue or be excessive a sponge dipped in 10 volume Hydrogen Peroxide and applied with firm pressure to the area will generally be sufficient to arrest it. If it fails to do so the wound should be cleansed and an endeavour made to seize the bleeding point with pressure forceps or the faucial pillars may be temporarily sutured. In the last resort the external carotid artery would need to be ligatured. Morell Mackenzie says that "Mr. Macarthy successfully tied the common carotid artery at the London Hospital" in a case of tonsillar haemorrhage.

Reactionary and secondary haemorrhage should be similarly treated. Osler and Macrae (System of Medicine, Vol. 11) quote a case of haemophilia in which the

haemorrhage was controlled by injections of 20 cc. of rabbit serum after the child had been having continuous oozing for four or five days and every other means had been tried without avail.

6. Tonsillotomy.

The operation for tonsillotomy differs from the above in that the projecting portion of the tonsil, alone, is clipped off, leaving the deeper portion of the gland and the capsule complete in its bed.

7. The operation for removal of the tonsils by dissection - the method of Waugh and its modifications.

The mucous membrane covering the tonsil is seized with a Hartmann's conchotome and divided above the upper pole with a pair of blunt pointed scissors curved on the flat, or with a pair of fine toothed dissecting forceps. The forefinger is then inserted between the pharyngeal wall and the capsule of the tonsil so that the tonsil is shelled out of its bed. If it remains attached below, where the tonsil shades into the lingual tonsil, it is separated with a wire snare.

D. Mackenzie (Practitioner, 1922, p. 314) incises the anterior faucial pillar with a sharp scalpel or else scrapes it off the tonsil with a sharp tonsil dissector. He advocates local anaesthesia in adults, but says that it is inadmissable in children. To induce the anaesthesia he follows the technique of Horgan of Cork. He first swabs the surface of the tonsil and surrounding parts with equal parts of cocaine (10%) and adrenaline (1 in 1,000). He then infiltrates the tissues with 5% novocain.

Horgan uses, to grasp the tonsil, a forceps which is an exact replica, on a larger scale of Spencer Wells' artery forceps. It is about 10" in length. A Mackenzie's blunt dissector is pushed through the plica into the extra-tonsillar region and is worked first of all in an antero-posterior direction and then by a strong upward sweep the upper pole is cleanly and totally evulsed. The lingual pole is separated by suitable scissors and a snare.

8. After treatment.

The patient should remain in bed for two days and be given a milk diet. Soft foods are necessary for a week after the operation. A certain amount of comfort is derived from an antiseptic gargle; or, if the soreness be keenly felt, ice may be given to suck.

Children must be taught to breathe through the nose, for, if the nasal obstruction has been present for some time, the habit of mouth breathing is not easily broken. Fresh air, a healthy life, and perhaps some respiratory exercises will do much to inculcate nasal breathing.

9. End results after Operative Treatment.

In the majority of cases nothing but good results from tonsillectomy in those children where there was been a definite indication for the removal of the growths. Not only are the mechanical and infective concomitants eliminated but the child's general health and digestion improves, his mentality becomes more acute and the dangers which follow in the train of the disorder are prevented.

Thus, Wrigley and Archer (Journ. Laryng. & Otol.

March 1922) in recording the end results of 200 consecutive cases in which at least a year had elapsed since the operation found that in 128 cases of nasal obstruction and mouth breathing, all the symptoms were relieved except in 3; in 34 cases of tonsillitis, all were relieved; in 93 cases of non-suppurative deafness, all cured except 7; in 39 cases of suppurative otitis media, all relieved except 11; in seven cases of enlarged cervical glands all cured but one; and in seven cases of quinsy, all cured. Tonsils completely removed did not recur, but in six cases the lower pole of the tonsil remained through incomplete removal. Adenoids recurred in three cases, but in only one was the recurrence sufficient to require further operation.

Milne Dickie (Journ. of Laryng. & Otol. 1914, p. 184) in recording the results of 60 cases who reported 4 - 22 months (majority about a year) after operation says that only two had had any illness since the operation - one whooping cough and one influenza, while three cases had had mild sore throats since the operation and in these a small tag of tonsil was still present.

It is difficult to find in the literature any such definite results as these from any other form of treatment.

On the other hand Kenelm Digby (Immunity in Health) p. 94) quotes Crowe, Watkins and Rotholz (John Hopkins' Bulletin 1917, XXVIII, 1) who observed, in patients whose tonsils had been removed, an enlargement of the cervical glands, a recurrence of arthritic symptoms, repeated attacks of rheumatic fever and especially frequently a

recurrence of chorea after a mild coryza. He also quotes, (p. 94) Zahorsky, (Interstate Med. Journal 1919, XXVl, p. 67) who, in publishing the results of the operation in 150 children observed 6 months to 5 years afterwards, states that the child beginning his school life without the tonsils is in greater danger of acute diseases than one who still has them.

Of those who favour tonsillotomy in preference to the more radical operation, McBride (Journal of Laryngology and Otol. 1916, p. 334) in a review of his great experience doubts whether tonsillectomy is necessary; so long as the part containing the crypts is removed and the supratonsillar fossa drained, the acquired end has probably been attained. Mark Hovell (Journal of Laryngology 1921 No. 10, p. 457) quotes cases where tonsillotomy had been done 17 to 34 years previously and in which there had been no further trouble. His conclusion is that enucleation of the tonsils as a routine measure is unjustifiable because they will shrink to normal dimensions after restoration of a free nasal airway; because of deaths from haemorrhage after enucleation; and because of cicatrisation which affects the singing voice in adults or prevents its development in children.

Merral (Lancet 1922, Apl. 1st, p. 663) agrees with other observers who think that the enlargement of the palatine tonsils is always secondary to adenoids and that therefore they should merely be snipped off level with the pillars of the fauces when the adenoids are excised.

GROUP 1V.

1. The contra-indications to operative treatment in Group 111 cases are as follows:-

a. Local.

i. Acute Tonsillitis.

ii. Physiological enlargement of temporary character accompanying periods of dentition.

iii. Professional voice-users.

b. General

i. Cardiac diseases.

ii. Advanced cardio-vascular changes:

(A) Anaemias (primary) leukaemias and Hodgkin's disease.

(B) Low coagulation power of the Blood - haemophilia, etc.

(C) Blood pressure over 225 mm. systolic.

(D) Arteriosclerosis.

iii. Advanced tuberculosis.

iv. Syphilis - especially if accompanied by ulcerative processes.

v. Bright's disease.

vi. Diabetes mellitus.

vii. Grave nerve or mental disorders,e.g. chorea, exophthalmic goitre, etc.

viii. Enlargement of the thymus gland. (Irwin Moore, Journ. of Laryn. 1919 p. 387.)

These cases should be treated as in Group 11 and in addition:-

a. X-ray treatment may be tried; Stewart (B.M.J., 1913,

i., p. 1157) found in the treatment of seven cases that although the tonsils do not as a rule gain their normal size the decrease in size is sufficient to dissipate obstructive symptoms and conditions dependant on the septic state of the tonsils and adenoids are relieved. Murphy (Journ. of Amer. Med. Assn., 1921, 228) employed the method in 46 cases, in all but 4 cases a marked shrinkage of the tonsils was noticed in two weeks. (Quoted by Wright, Medical Annual, 1922, p. 472.)

b. Administration of lymph gland extract. Hugh Ashley (B.M.J., 1913, i., p. 1159) working on the hypothesis that the enlargement is due to an attempt on the part of nature to supply a deficiency in the other lymphoid tissues of the body, administered lymph gland extract in five grain doses to thirty cases and says that all the cases improved - snoring disappeared and the tonsils diminished in size.

c. The application of alkaline caustics of which London Paste (originally introduced by Morell Mackenzie) is probably the best. The paste consists of slaked lime and caustic soda, equal parts of each. It is powdered and kept in a well-stoppered bottle until required, when about a third of its weight of water is added to form a thin paste. It may be applied, after cocainisation, by means of an applicator such as that of Irwin Moore.

d. If the above methods fail the galvano cautery may be applied. St. Clair Thomson says that six to ten or twenty sittings are required and that adhesions are liable to result.

XII. Summary and Conclusion.

1. In Nottingham where great care is being exercised in the treatment of cases of Enlarged Tonsils and Adenoids the age incidence is becoming lower than the average.

2. There is no indication that the exanthemata and the catarrhal infections have any effect in causing Enlarged Tonsils and Adenoids unless the child is otherwise susceptible to the condition. If the child is susceptible they are a prominent cause.

3. Susceptibility may be due to a number of causes such as unhealthy surroundings, a low-lying, damp climate, artificial feeding, dietetic faults, and narrowness of the nasal cavities.

4. Dental caries is a prominent source of infection, which, acting over a long period of time, devitalises the child and forms a focus of infection which continually attacks the adjacent tonsils.

5. Prophylaxis requires more attention than it has received in the past.

6. Care of the teeth, nasal hygiene, careful attention to catarrhs and the exanthemata, a rational diet and plenty of exercise in the fresh air are the main indications for the avoidance of the disease.

7. Children who, on inspection are found to have enlarged tonsils and adenoids should be grouped according to the degree of the growths.

8. In all cases any focus of infection in the mouth

or throat should be attended to as well as the general health.

9. If the nasal obstruction is slight and the tonsils are not septic, operative measures should be postponed, but treatment on conservative lines should be persevered with.

10. Every child should be subjected to examination at regular intervals in order that the progress of the condition may be watched.

11. When nasal obstruction is marked the adenoids should be removed with the curette.

12. When the tonsils are enlarged and are causing mechanical difficulties in speaking or swallowing, they should be snipped off level with the faucial pillars.

13. When the tonsils are chronically inflamed or are acting as a gateway of infection to other parts of the body, they should be enucleated.

14. The method of choice for operation in children is enucleation by the guillotine. A general anaesthetic is advisable and ethyl chloride is suitable.

15. The method of choice for operation in adults is enucleation by dissection. It can be well performed, in expert hands, under local anaesthesia.

16. Where operative treatment is advisable on account of the condition of the growths but is contraindicated because of the condition of the patient other methods should be tried. Of these treatment by X-rays holds out great promise.

Finally I desire to record my thanks to Mr.H. Bell Tawse the Aural Specialist to the Nottingham Education Committee, for giving me opportunities for examining patients at his clinics and for confirming my opinion that the cases noted in Table A. were of such severity that operative treatment was necessary.

BIBLIOGRAPHY.

ALLBUTT & ROLLESTON, System of Medicine, 2nd edit. vol. iv. part ii, p. 93.

ASHLEY, H. J. "The Cause of Enlarged Tonsils in Children" B.M.J. 1913, 1., p. 1159.

AYMARD, J. L. "Tonsillar Haemorrhage" Journ. of Laryng. & Otol. 1921, p. 429.

BALLENGER "Diseases of the Nose, Throat and Ear." 4th edit.

BARWISE "A Tonsil & Adenoid Enquiry" Lancet, 1922, 1., p. 663.

BROWN, LENNOX "The Throat & Nose & their diseases" 3rd edit.

BURNETT, INGALLS & NEWCOMBE "Diseases of the Ear, Nose & Throat," 1901.

CAMERON, HECTOR "Reaction of a Child to Faulty Environment," Practitioner 1916, pp. 61, 137, and 246.

CAMPBELL, HARRY "The Etiology of Adenoids" Lancet 1921 11, 1079.

CARMICHAEL, SCOTT "Tuberculosis of the Tonsil Associated with Tubercular Glands of the Neck" Proc. Roy. Soc. Med. (Sect. Study of Diseases of Children) Nov. 1909, p. 27.

CHASSAIGNAC "Leçons sur L'Hypertrophie des Amygdales" 1854.

CUNNINGHAM "Text Book of Anatomy" 2nd edit.

DICKIE, J. MILNE "Immediate & Remote Effects of Operations on the Tonsils" Journ. of Laryng. & Otol. 1914, p. 184.

DIGBY, KINELM — "Immunity in Health" 1919.

DONELAN, J. — "A Critical Note on the Value of Pituitrine Preparations in Reducing Operative or Post Operative Haemorrhage." Journ. of Laryng. & Otol. 1913, p. 353.

"Some Suggested Alternatives to Operation for Adenoids and Enlarged Tonsils in Young Children" Jounr. of Laryng. & Otol. 1919, p. 230.

GARDINER — "Tonsils & Cervical Adenitis." Lancet 1915, ii, p. 752.

HETT, SECCOMBE — "The Anatomy of the Capsule and its Clinical Significance" B.M.J. 19.11.1910.

"On the Anatomical Varieties and their Bearing on the Treatment of Pathological Conditions of the Palatine Tonsils." Lancet 1909, 1., p. 457.

HICKLING, GERTRUDE — "Nasal Drill." B.M.J. 1920, 1,, 147.

HILL, W. — "The Prevention and Treatment of Haemorrhage in Enucleation of the Tonsils." Pract. 1918, p. 301.

HILL & ELPHICK — "On the Minimizing of Haemorrhage in the Extirpation of the Tonsils and the Employment of the Haemostatic Guillotine" Journ. of Laryng. & Otol. 1914, p. 545.

HORGAN — "Tonsillectomy by Blunt Dissection under Local Anaesthesia" Journ. of Laryng. & Otol. 1915, p. 482.

HOVELL, MARK — "Is the Mere Enlargement of a Tonsil Good and Sufficient Reason for its Removal?" Journ. of Laryng. & Otol. 1921, p. 457.

HOWARTH — "Enucleation of the Tonsils." Lancet 1916, 11, 600.

HOWARTH & GLOYNE — "Unhealthy Tonsils and Cervical Adenitis" Lancet 1921. p. 997.

LAURENS — "Oto-Rhino-Laryngology" trans. by H. H. Clayton Fox.

LEATHART — "Chronic Infection of the Faucial and Post Nasal Lymphatic Tissue in Children" B.M.J. 1920. 1. 217.

McBRIDE, P. — "Past and Present of Otolaryngology" Journ. of Laryng. & Otol. 1916. p. 334.

MACKENZIE, DAN — "Enucleation of the Tonsils" Clinical Journ. 13.12.1911.

"Enucleation of the Tonsils under Local Anaesthesia." Pract. 1922. p. 314.

MACKENZIE, MORELL — "Diseases of the Throat and Nose" Vols. 1 & 11, 1880.

MACLAY — "Bacteriology of the Tonsillar Crypts" Laryngoscope 1918, p. 589.

MERRALL — "The Essential Causes of Adenoids" Lancet 1921, 11, 994.

"Adenoids and the Common Cold." Lancet, 1922, 1., 663.

MITCHELL, A. P. — "Primary Tuberculosis of the Faucial Tonsils" Journ. of Laryng. & Otol. 1918, p.8.

MOLLISON, W. M. — "The Tonsils as a Focus of Infection" Journ. of Laryng. & Otol. 1921, p. 190.

MOORE, IRWIN — "The treatment of Enlarged and Diseased Tonsils" Journ. of Laryng. & Otol. 1919, p. 387.

"Haemorrhage following removal of the Tonsils" Pract. 1918, p. 334.

MUECKE, F. "Nasal Obstruction and its Consequences" Pract. 1921, p. 236.

NEWMAN, GEO. "Annual Report of the Board of Education" 1920.

O'MALLEY "Enucleation of the Tonsils" B.M.J. 1913 1, p. 699.

ORMISTON "A Device for the Prevention and Treatment of Adenoids." Lancet 1918, 11, p. 240.

OSLER & MACRAE "System of Medicine, Vol. 11, (Articles on "Adenoids" and "Chronic Hypertrophy of the Tonsils" by Packard)

PORTER "Diseases of the Throat, Nose and Ear" 3rd edit.

POYNTON & PAINE "Etiology of Rheumatic Fever" Lancet 1900, 11, p. 961.

PYBUS "Some Infections of the Tonsils" Hunterian Lecture, Lancet 1915, 1., 1009 and 1065.

SCHAFER "Essentials of Histology."

STEWART, IRVINE "Oral Sepsis in its Connection with Throat Disease" Lancet 1909, 1. p.1822.

STEWART, W. "The Treatment of Adenoids and Enlarged Tonsils without Operation." B.M.J. 1913, 1, p. 1157.

STILL, G. F. "Common Disorders and Diseases of Children." 3rd Edit. p. 314.

SYMINGTON "The Pharyngeal Tonsil." B.M.J. 1910 11, p. 1147.

THOMSON, JOHN "The Clinical Study and Treatment of

Sick Children" 3rd edit.

THOMSON, ST. CLAIR — "Diseases of the Nose and Throat" 2nd edit.

TILLEY — "Diseases of the Nose and Throat" 3rd edit.

TOD, HUNTER — "Removal of Adenoids in Infancy" Pract. 1920, p. 335.

TURNER, LOGAN — "Critical Review" Journ. of Laryng. & Otol. 1921, p. 79.

WALLIS, SIM — "The Aetiology of Adenoids" Lancet 1921, 11, p. 1347.

WAUGH, — "A Simple Operation for Complete Removal of the Tonsils" Lancet 1909 1., p. 1314.

WHILLIS & PYBUS — "On the Enucleation of the Tonsils with the Guillotine" Lancet 1910 11, p. 875, and B.M.J. 1911, 11, p 1402.

WILLIAMS, E. WATSON — "The Risks after Operation for Tonsils and Adenoids" B.M.J. 1920 11, p. 887.

WISHART, D. J. GIBB — Report of Meeting of Amer. Laryng. Rhin. & Otol. Soc. in 1915, (Journ. of Laryng. & Otol.1916, p. 526.)

WOAKES — "Post Nasal Catarrh" 3rd Edit. 1884.

WRIGLEY & ARCHER — Epitome of Current Medical Literature B.M.J. 1922, 1, p. 50.

WRIGHT — "Diseases of the Tonsils" Medical Annual 1922, p. 472.

YEARSLEY, MACLEOD — "The Naso-Pharynx and its Relation to Other Regions." Clin. Journ. 20.3.1912.